Microbial Source Tracking Data

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Washington Suburban Sanitary Commission

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Background

- Sanitary Sewer Overflow Consent Decree
- Negotiated over several years, entered in Court December 2005
- Water Quality Monitoring Plan
  - Total bacteria
  - Bacterial source tracking : an emerging technology
- WSSC commissioned “White Paper” to identify state-of-the-art BST technologies

Consent Decree

- **No guidance or rationale for:**
  - Selection of sampling points
  - Stream flow conditions
  - Analytical methods
  - Criterion for expected reduction in human source bacteria following collection system repair, rehabilitation, or replacement

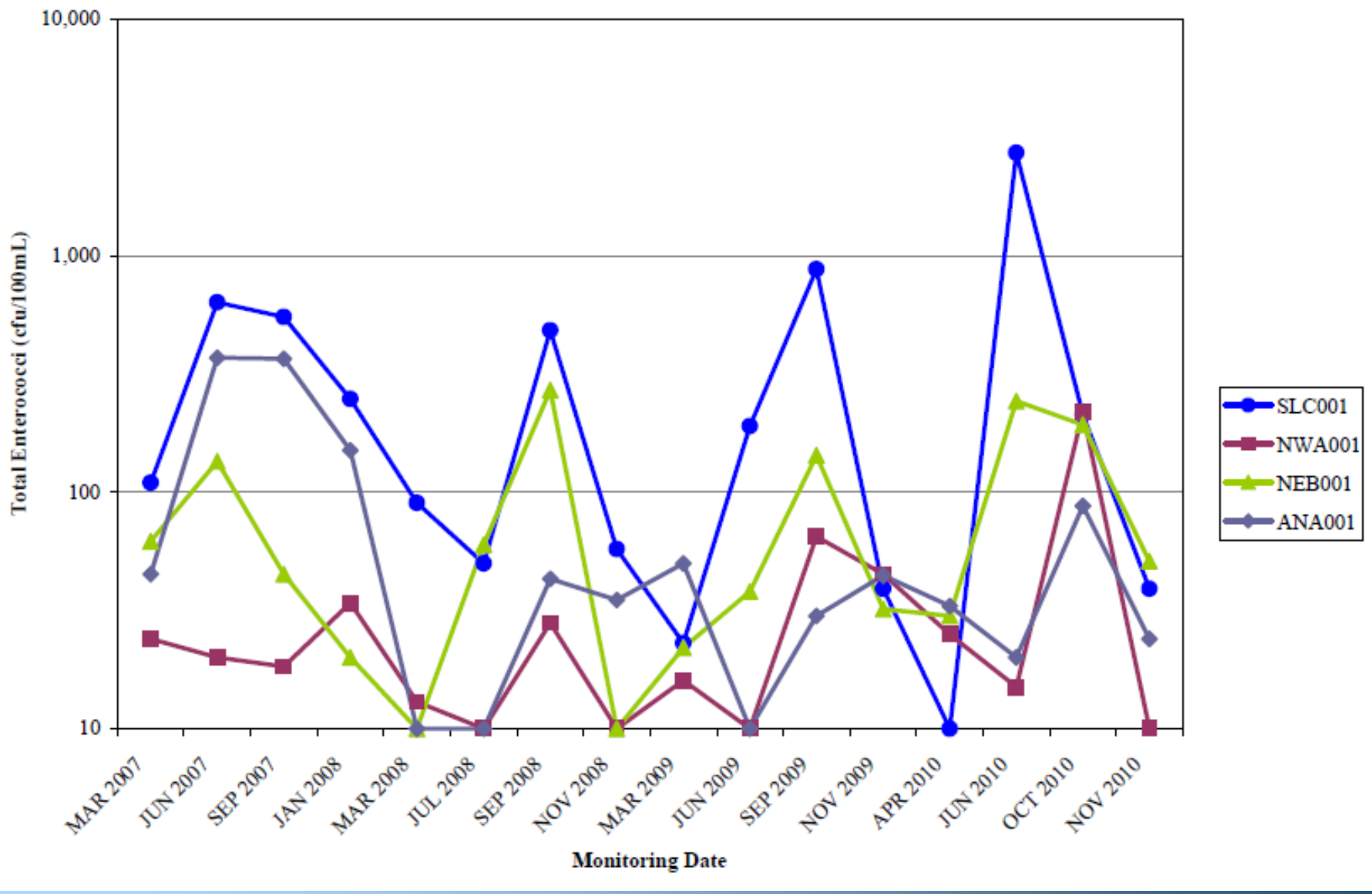
WQM Plan

- **Monitoring scope:**
  - 26 sewer basins (annual sampling)
  - Semi-annual sampling (20 sewer basins)
- **Prepared by EA Engineering:**
  - Selected BOX-PCR for MST analyses
  - Identified sampling stations, stream flow criterion
- **Quarterly reporting format:**
  - Alphabetical by sewer basin name
  - Data in columns for BST and total bacteria values

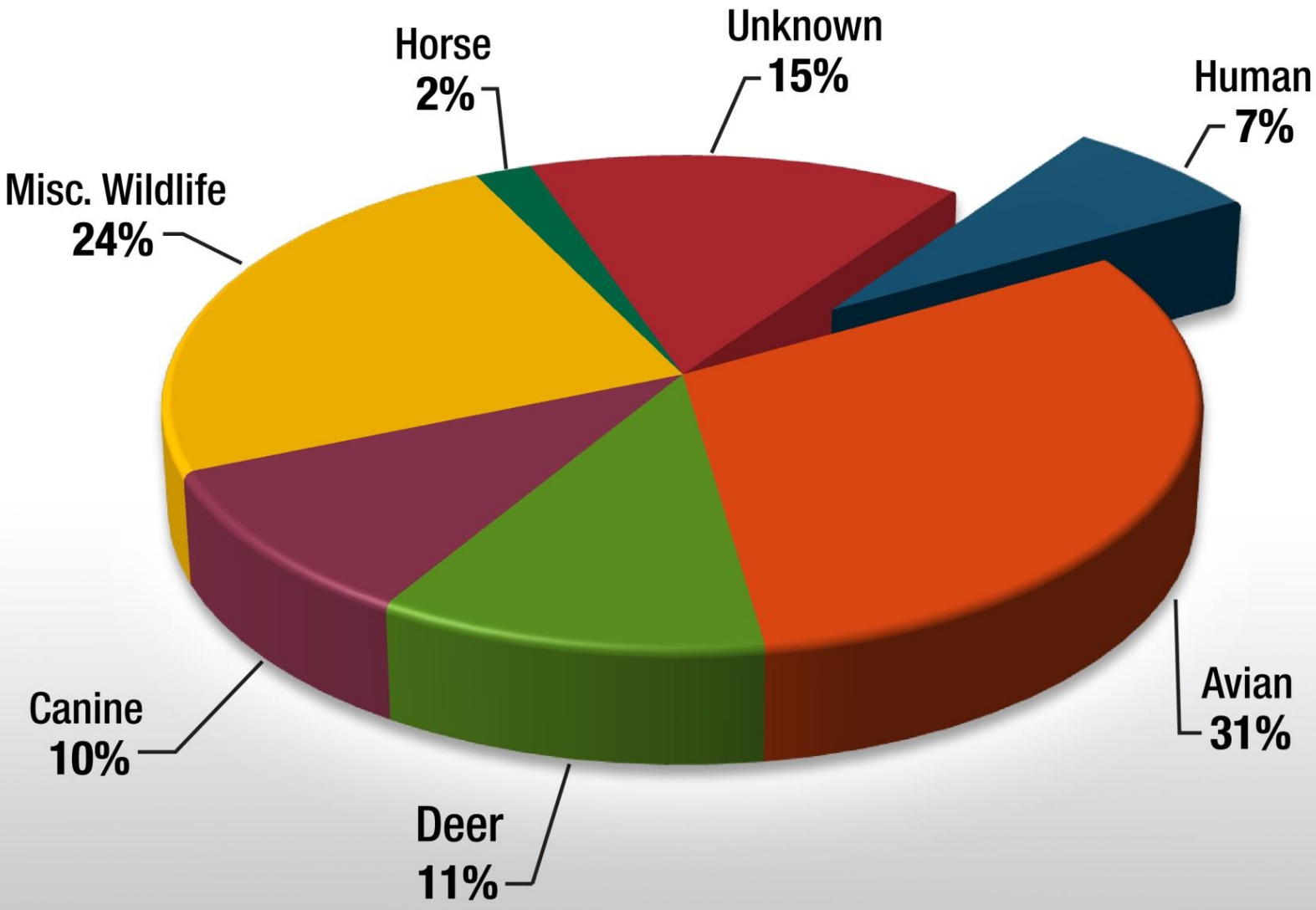
WQM Implementation

- **Underway since March 2007**
  - Voluntary quarterly sampling in selected Anacostia River sewer basins 2007–2011 (→ not statistically different)
  - Added MST "toolbox" tests: fluorescence, human bacteroides HF183
- **Nine years of data (thru March 2015):**
  - No mandate to evaluate findings or trends
  - EA Engineering prepared two data reports
  - Sewer system rehab. completed in 2 basins, still underway in others

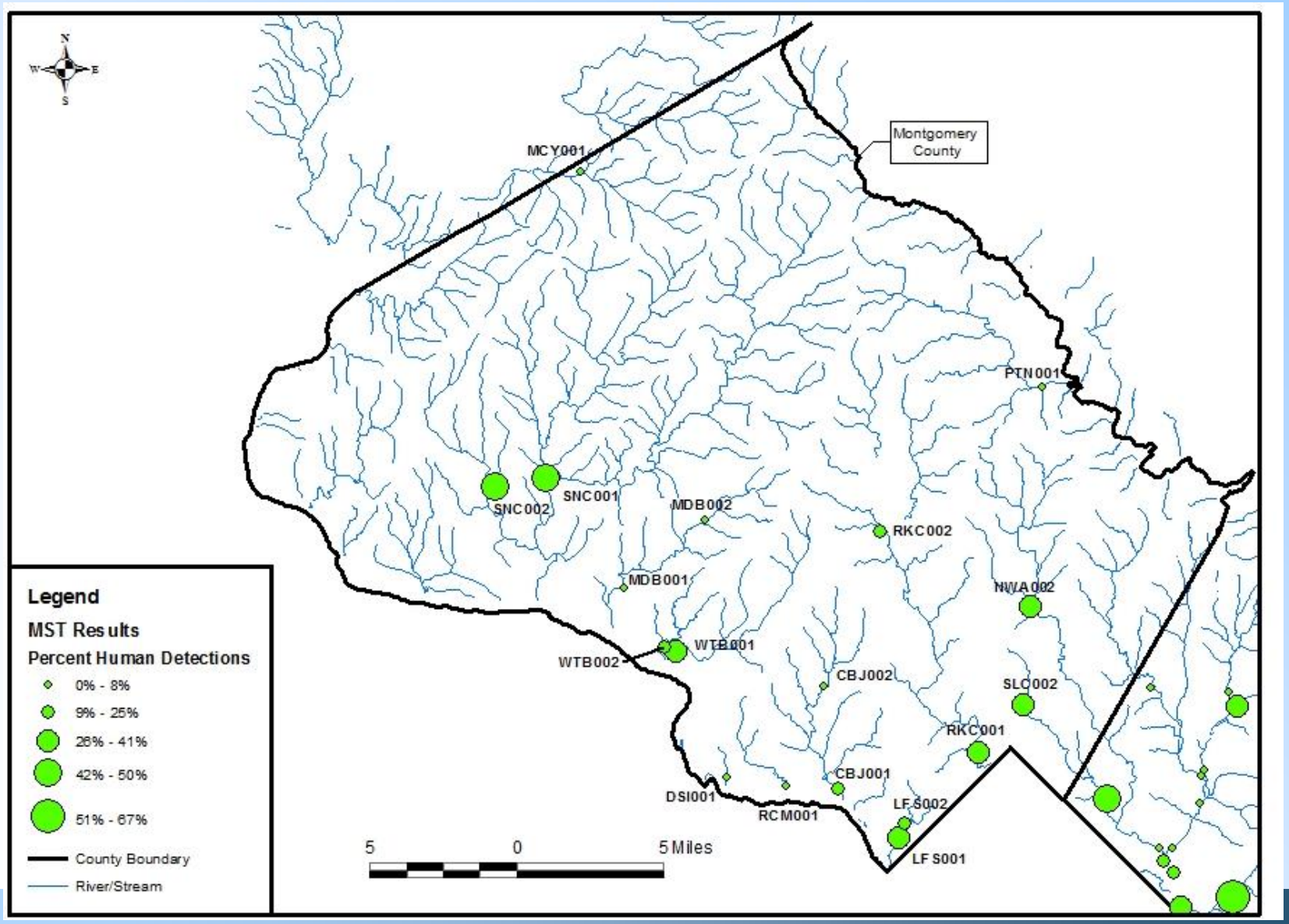
Strong Seasonality



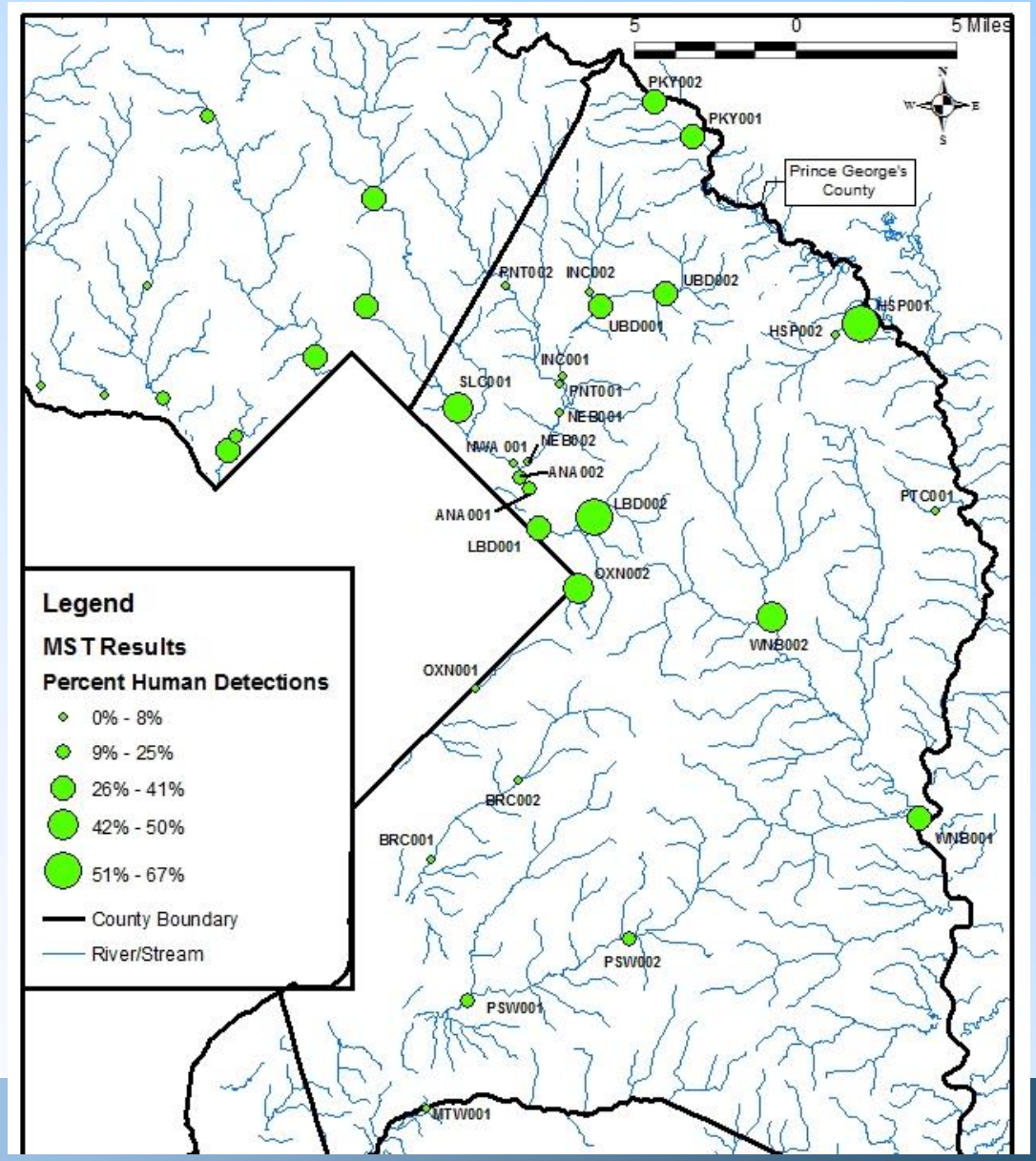
Average Percent Source Contributions of Fecal Bacteria in Surface Waters of Prince George's County and Montgomery County



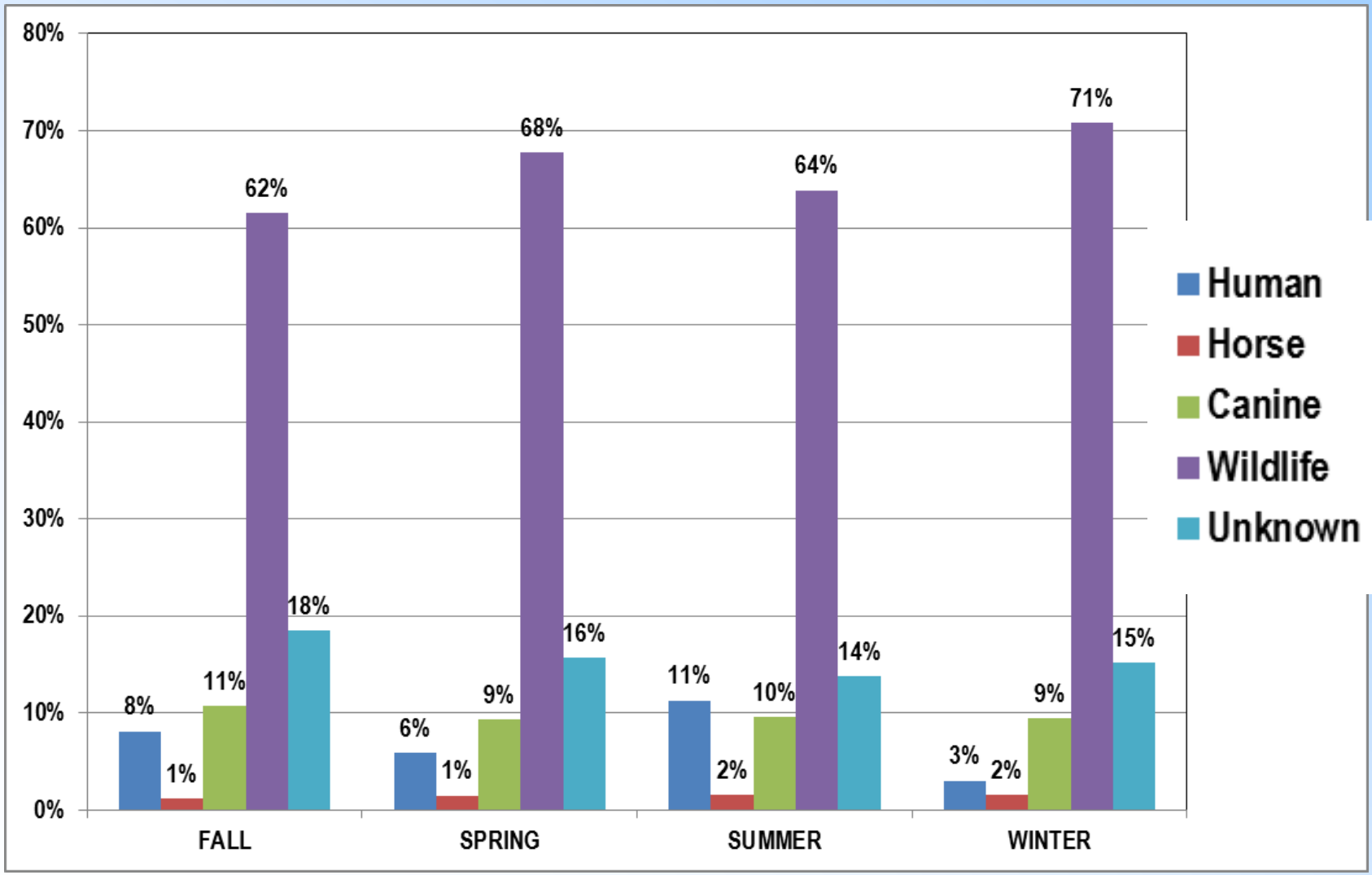
Human Detections – Montgomery County



Human Detections – Prince George's County



Average Seasonal Source Allocations

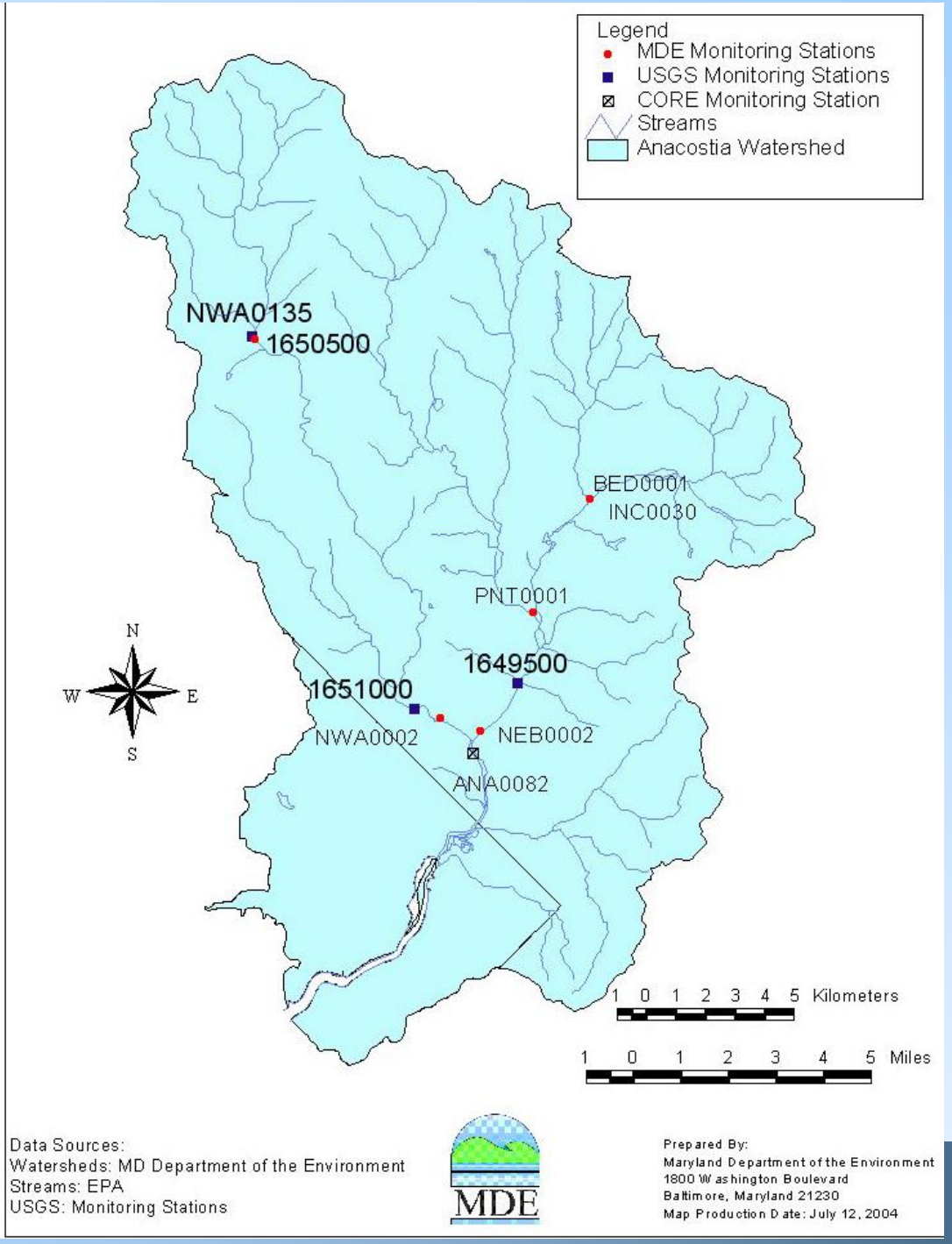


MDE's BST Study in Anacostia River Watershed

- MDE conducted surface water sampling at 6 stations in 2002/2003
  - WSSC collects data at same locations
- Samples collected monthly for period of 1 year
  - Mix of low flow and high flow conditions
- BST conducted using Antibiotic Resistance Analysis (ARA) by Salisbury University
- BST results used for TMDL Allocations

MDE's BST in Anacostia River Watershed

- **Source Categories:**
  - Human
  - Domestic Animal = dog
  - Livestock = horse, pig, goat, sheep, chicken, cow
  - Wildlife = goose, deer, rabbit, fox
  - Unknown

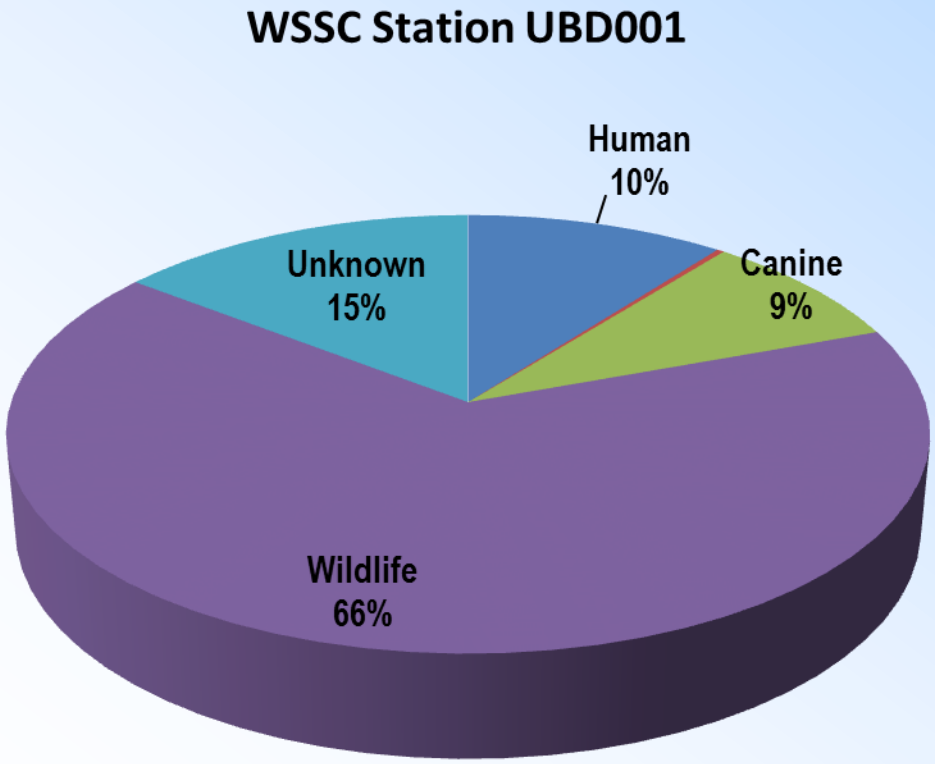

Legend
MDE Monitoring Stations
USGS Monitoring Stations
CORE Monitoring Station
Streams
Anacostia Watershed
NWA0135
1650500
BED0001
INC0030
PNT0001
1649500
1651000
NWA0002
NEB0002
ANA0082
N
W
E
S
1 0 1 2 3 4 5 Kilometers
1 0 1 2 3 4 5 Miles
Data Sources:
Watersheds: MD Department of the Environment
Streams: EPA
USGS: Monitoring Stations
MDE
Prepared By:
Maryland Department of the Environment
1800 Washington Boulevard
Baltimore, Maryland 21230
Map Production Date: July 12, 2004

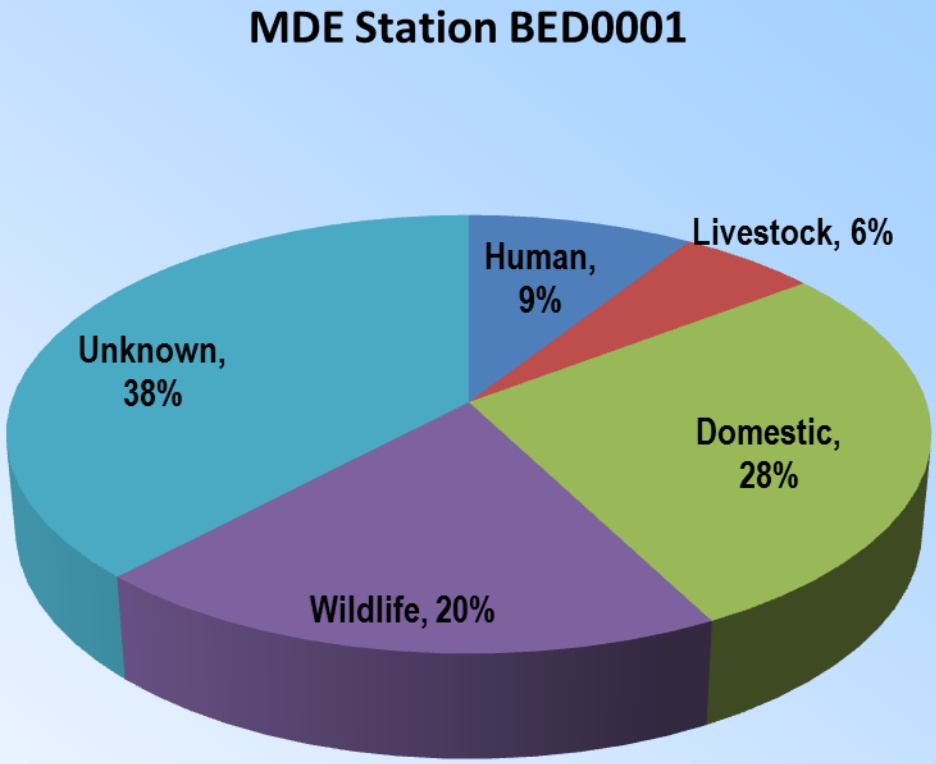
MDE's BST in Anacostia River Watershed

Average Percent Allocations in MDE's Study

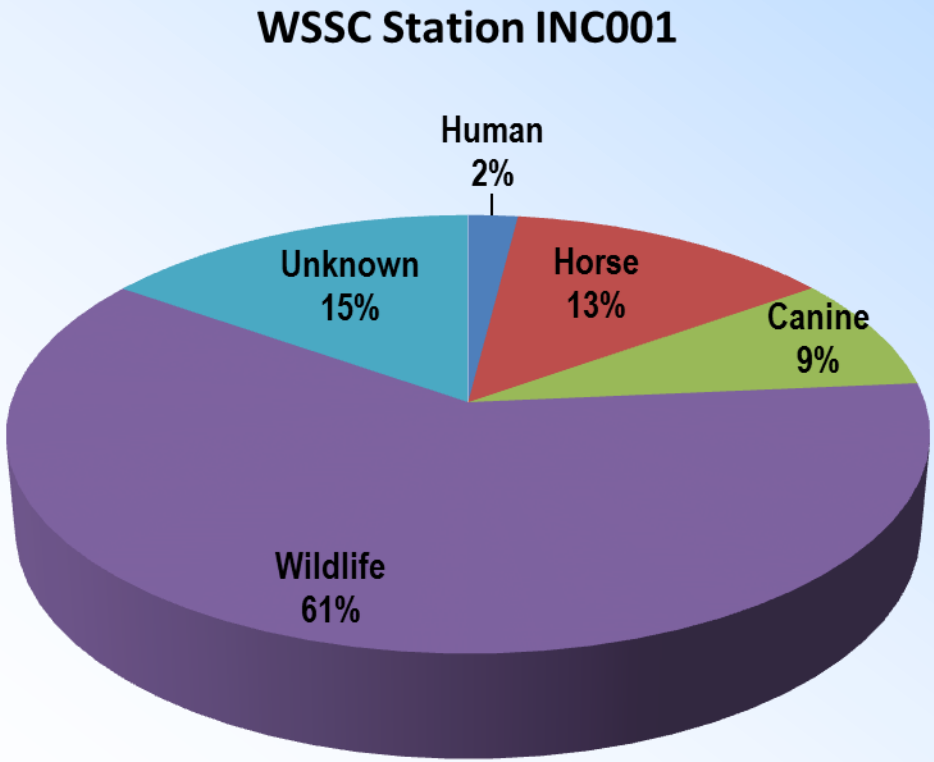
Station ID	Human	Domestic	Livestock	Wildlife	Unknown
BED0001	9.1	27.7	5.6	19.7	38
INC0030	17.3	22.5	9.9	24.4	25.9
NEB0002	6.6	17.3	20.1	26.7	29.3
NWA0002	10.4	19.4	4.8	27.3	38.1
NWA0135	36.4	18.8	3.7	7.7	33.3
PNT0001	16.3	20.4	5.3	29	29

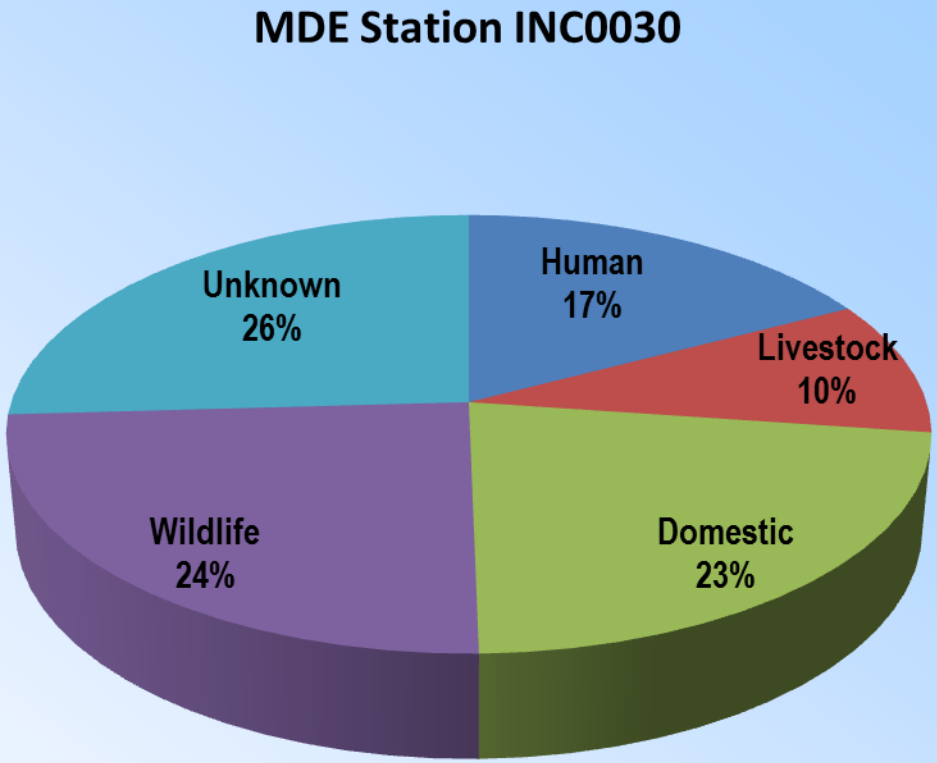
Comparison to MDE's BST in Anacostia River Watershed: Beaverdam Creek



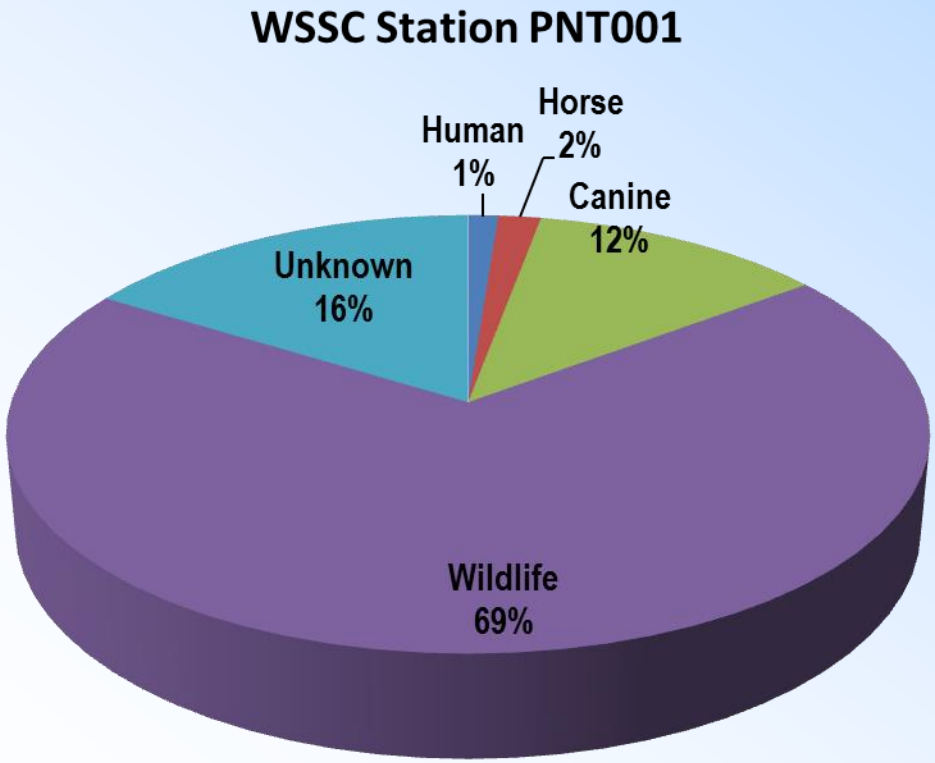


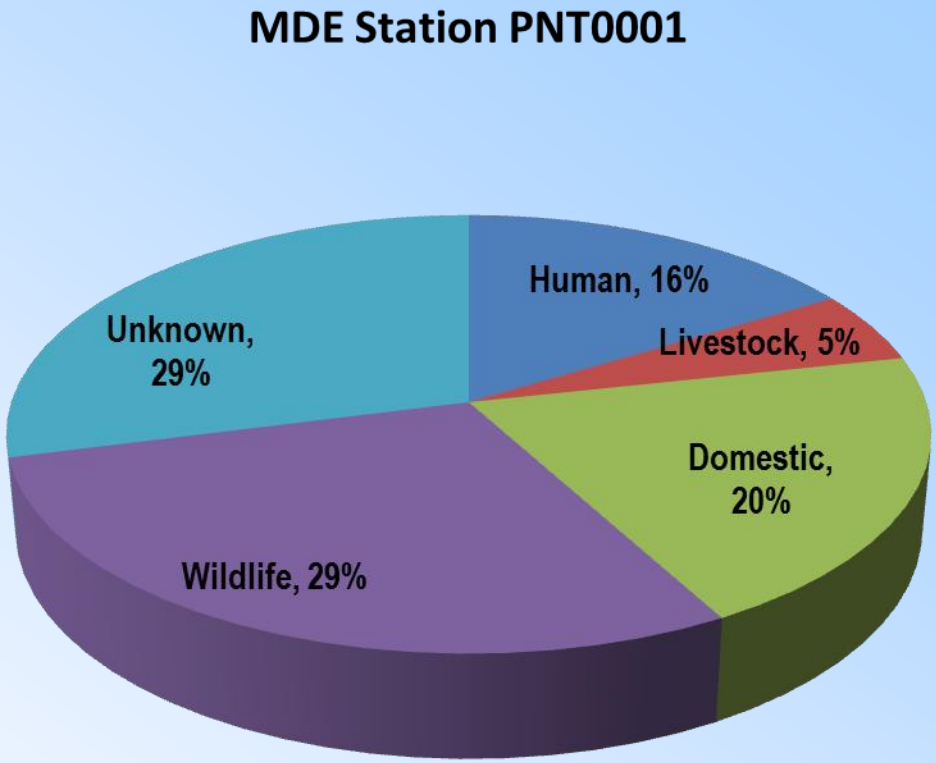
Comparison to MDE's BST in Anacostia River Watershed: Indian Creek





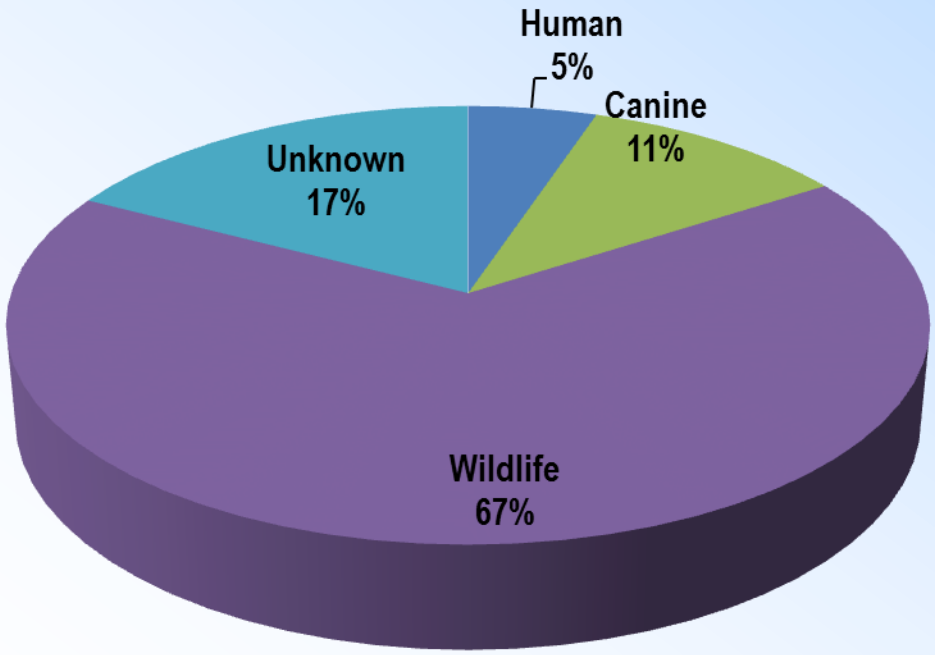
Comparison to MDE's BST in Anacostia River Watershed: Paint Branch



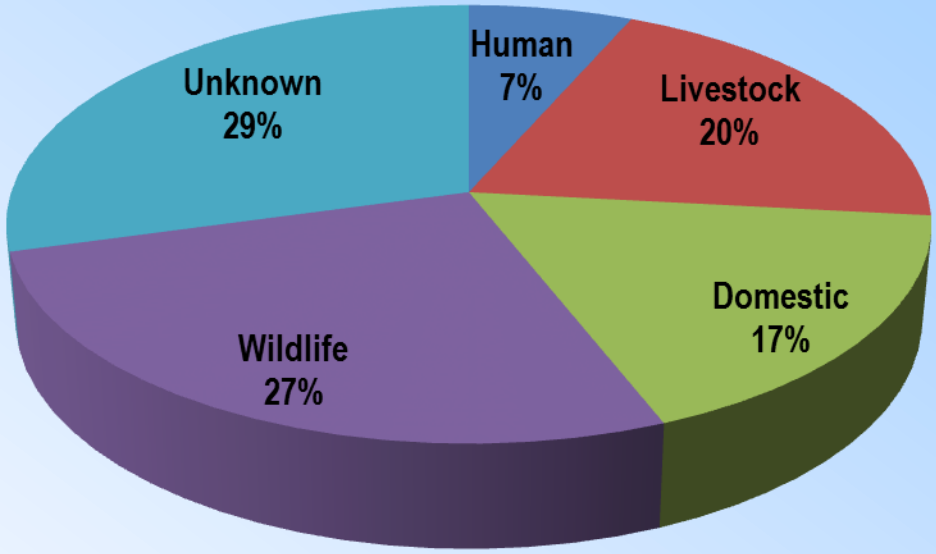


Comparison to MDE's BST in Anacostia River Watershed: Northeast Branch

WSSC Station NEB002

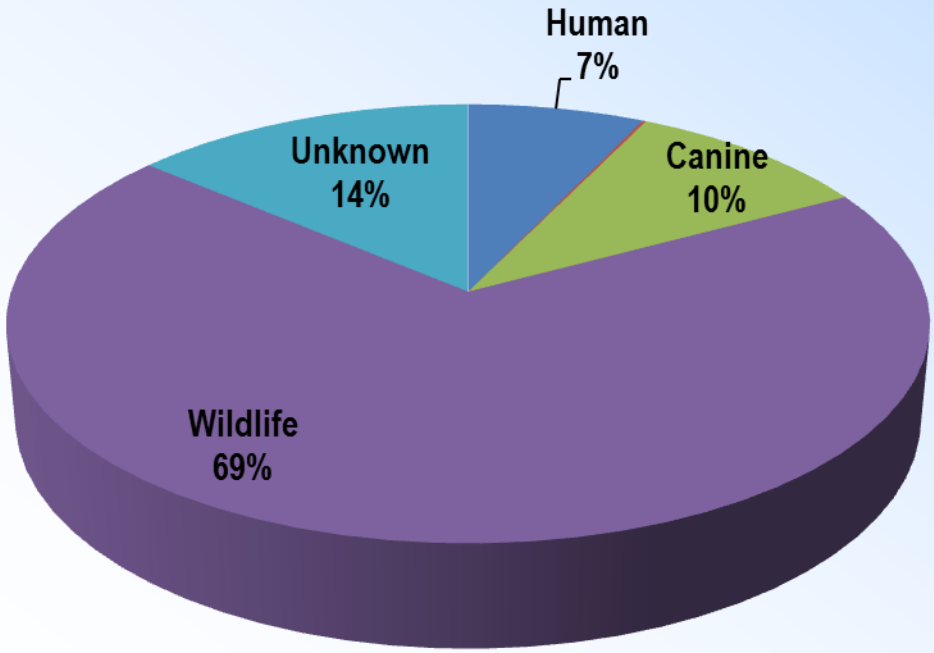


MDE Station NEB0002

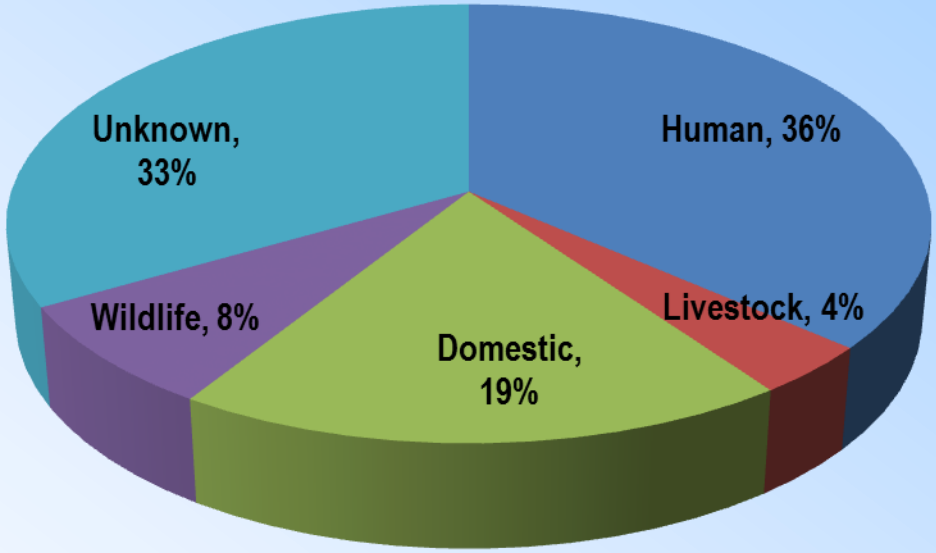


Comparison to MDE's BST in Anacostia River Watershed: Northwest Branch Upstream

WSSC Station NWA002

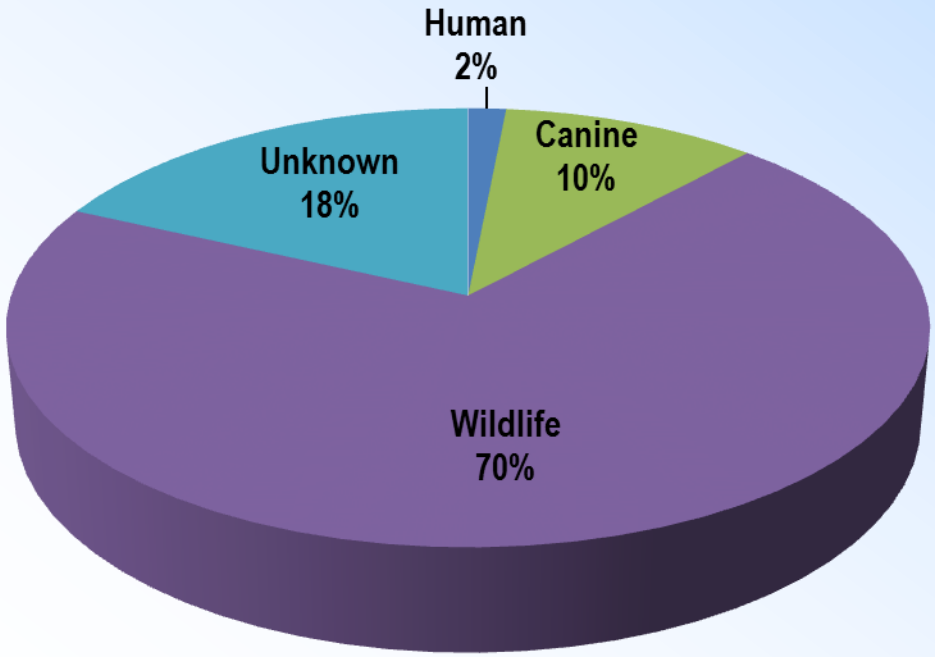


MDE Station NWA0135

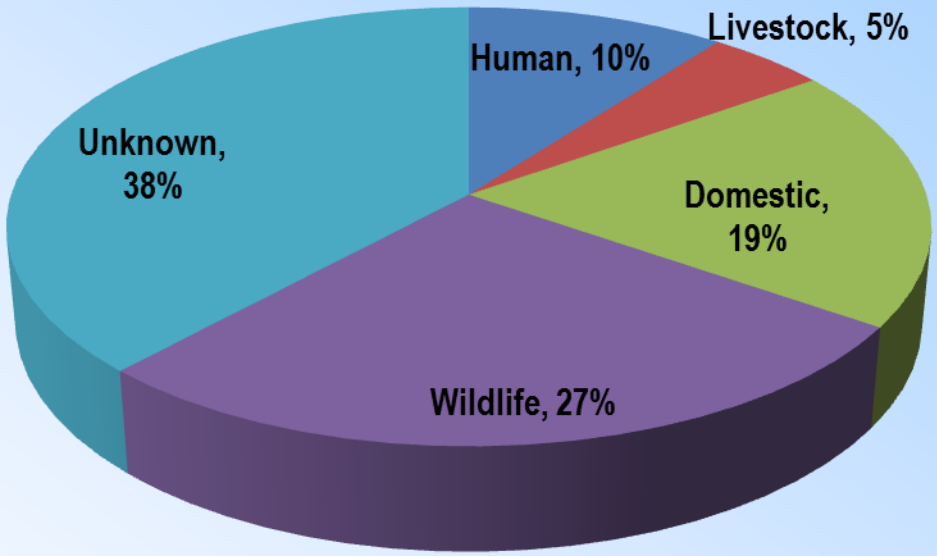


Comparison to MDE's BST in Anacostia River Watershed: Northwest Branch Downstream

WSSC Station NWA001



MDE Station NWA0002



Source Contributions used for TMDL Allocations

Allocation Category	Human	Domestic Animals	Livestock	Wildlife
WWTP	X		X[1]	
MS-4		X		X
LA	X		X	X

1. Special condition for USDA treatment plant

TMDL Reduction Targets

Maximum Practicable Reduction Targets

Human	Domestic	Livestock	Wildlife
95%	75%	75%	0%

TMDL Reduction Targets

Station	% Domestic Animals	% Human	% Livestock	% Wildlife	% Target Reduction
BED0001	98%	98%	98%	81%	91%
INC0030	98%	98%	98%	66%	88%
PNT0001	98%	98%	98%	72%	87%
NEB0002sub	98%	95%	98%	49%	79%
NWA0135	98%	98%	98%	14%	88%
NWA0002sub	98%	98%	98%	53%	78%

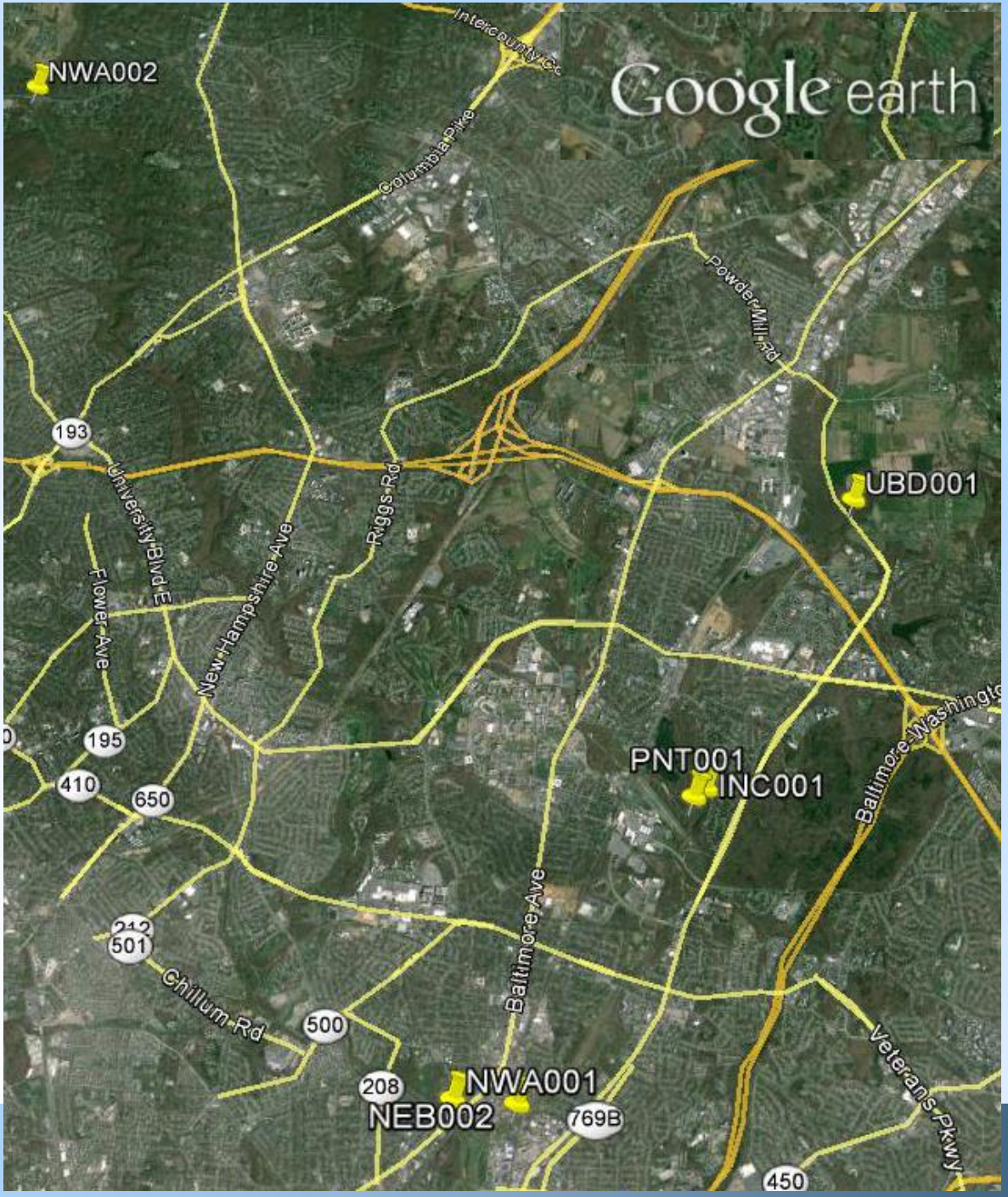
Conclusions

- Often unreasonable to reduce non-human microbial loads by 90% as required in some MS4 permits
  - Stormwater BMPs have limited/contradictory data on bacterial reduction
- The ARA Method used by MDE to develop load allocations likely underestimates wildlife contributions
- Genetic-based MST methods have replaced ARA, and have become reasonably inexpensive
- Counties with fecal bacteria TMDLs could benefit from MST by better characterizing human versus non-human sources

Questions?

.3.2: DC Final Average Bacteria Source Distribution for Anacostia Wat
am of the NWB and NEB Confluence and Upstream of the Maryland/D

Source ategory	Domestic Animals	Human	Livestock	Wildlife	Total
%	21.1%	22.2%	0.3%	56.5%	100.0


Google earth
NWA002
Columbia Pike
Powder Mill Rd
193
University Blvd E
Flower Ave
New Hampshire Ave
Riggs Rd
UBD001
195
410
650
PNT001
INC001
Baltimore Ave
501
Chillum Rd
500
208
NWA001
NEB002
769B
Veterans Pkwy
450